Section 3: Service Area and System Description

3.1 Introduction

Bremerton, situated in Kitsap County and approximately 15 miles west of Seattle across the Puget Sound, owns, maintains, and operates a comprehensive sanitary sewer collection and treatment system. This system serves West Bremerton, East Bremerton, and the surrounding areas of unincorporated Kitsap County as depicted in the vicinity map (Figure 3-1) and the sewer service area map (Figure 3-2). The system also accepts sanitary sewer flows from the U.S. Navy Puget Sound Naval Shipyard (PSNS), other U.S. Navy Facilities, and Kitsap County Sewer District No. 1 (KCSD No. 1) in West Bremerton. However, apart from the U.S. Navy, the system does not provide sewer service for significant industrial dischargers.

The City's sewer infrastructure comprises several key components including sewer mains (combined sanitary and storm, gravity, gravity-pressure, siphon, force/pressure), combined sewer overflow structures, pump stations, odor control stations, pressure-to-gravity surge chambers, a CSO treatment plant, a conventional wastewater treatment plant, and low-pressure sewer systems (grinder pump systems and low-pressure sewer mains).

Figure 3-1: Site Location

The City currently operates two wastewater treatment facilities. The WWTP, located in West Bremerton, provides secondary wastewater treatment for the entire system's wastewater service area and discharges treated wastewater into Sinclair Inlet. The Eastside CSO Treatment Plant, located in East Bremerton and sometimes referred to as the ESTP, treats combined sewer flows generated during heavy storm events in East Bremerton and discharges effluent to the Port Washington Narrows, the marine body of water that connects Dyes Inlet and Sinclair Inlet. The network connecting these treatment facilities and the service area includes gravity sewers (separated and combined), pump stations, and force mains.

In East Bremerton, flow generated in the sewer basins eventually enters the East Bremerton Beach Main (EBBM). The flow is conveyed to West Bremerton via two inverted siphons that cross under the Port Washington Narrows, entering Pump Station CE-1. CE-1 pumps into the Crosstown Pipeline (CTP), a nearly 4-mile-long pipeline which carries flows to the WWTP. The West Bremerton area also delivers wastewater to the WWTP via gravity sewers, pump stations and force mains. Flow sources include conventional wastewater, groundwater infiltration, and stormwater inflow.

The hydraulic capacity of the municipal combined sanitary sewer collection system and its associated components is deemed sufficient for the conveyance of dry weather wastewater flows to the WWTP for treatment. However, under conditions of extreme wet weather storm events, the combined sewer flows may surpass the hydraulic capacity of the existing combined sanitary sewer conveyance system and the WWTP/ESTP infrastructure. In such instances, historical data indicates that excess untreated combined sanitary sewer flows have led to overflow events at CSO outfalls.

3.2 Surrounding Vicinity Characteristics

This section provides a description of the surrounding vicinity, the sewer service area, and the existing sewer infrastructure.

3.2.1 City of Bremerton

Situated on the western shore of Puget Sound, the City of Bremerton is bordered by two major waterways: Sinclair Inlet and Dyes Inlet. The Port Washington Narrows, which connects these inlets, divides Bremerton into two distinct areas: East Bremerton to the northeast and West Bremerton to the southwest. Figure 3-1 provides an illustration of the City and its surrounding features.

3.2.2 Topography

Kitsap County lies in a structural downfold, referred to as the Puget Trough or Puget Sound Lowland, between two mountain ranges. The county occupies a long, narrow, and irregularly shaped section of the Kitsap Peninsula, characterized by numerous bays and smaller inlets that create an extensive, irregular coastline. Except for the southern boundary, the county is surrounded by the waters of Puget Sound. The terrain features gently rolling lowlands with moderate elevation changes.

3.2.3 Geology and Soils

Bremerton lies within the Puget Lowland and is part of a large glacial drift plain. This plain is characterized by low, gently rolling ridges that run north to south, separated by valleys and marine embayment. The area is covered by glacial tills, which is underlain by older glacial and interglacial deposits. The depth of the till ranges from a few feet to over 100 feet and typically consists of cobbles and coarse gravel embedded in clays, silts, and sands, forming a very dense material.

Beneath the till, from Bainbridge Island to Bremerton, are the sediments of the Blakely Formation. These sediments are made up of massive to moderately bedded, dark reddish-brown cobble to boulder conglomerates within a well-cemented matrix of coarse, poorly sorted sandstone. The sandstone and conglomerate contain a mix of subangular to well-rounded fragments of basalt, andesite, basaltic sandstone, dark gray siltstone, along with occasional quartzite and metamorphic rock fragments. Interbedded within the formation are thin layers of lighter gray-brown clay mudstone, carbonaceous siltstone, and coal. To the west of Bremerton, there is a significant outcrop of Eocene Crescent volcanic rocks.

3.2.4 Climate and Air Quality

A cool maritime climate prevails within the service area because of its proximity to the Pacific Ocean and the influence of Puget Sound. In addition to marine influences, the regional climate is affected by the Cascade and Olympic Mountain ranges, located east and west of Bremerton, respectively. Bremerton experiences relatively short, cool, dry summers and prolonged, mild, wet winters. Falls and winters are generally accompanied by prevailing southwesterly winds, while the winds in the spring and summer are generally from the northwest. Annual precipitation in the county ranges from about 30 inches in the northern parts to around 70 inches in other areas, with some southwestern parts receiving up to 70 inches. Around 80% of Bremerton's precipitation occurs between October and March. Snowfall remains infrequent and light, with depths typically between 3 to 6 inches in lower elevations. Snowmelt continues to occur within 24 hours following a snowstorm.

The Puget Sound Clean Air Agency (PSCAA) is the regional air quality management agency for Kitsap County. PSCAA represents the EPA, and monitors and manages air quality in the Puget Sound Region. Under the authority of the Clean Air Act, EPA established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for a set of "Criteria Pollutants". These pollutants include carbon monoxide, particulate matter (PM-10), ozone, sulfur dioxide, lead, and nitrogen dioxide. Areas of the country where air pollution levels persistently exceed the national ambient air quality standards may be designated by the EPA as "Non-attainment" areas. The planning area is not located in a designated non-attainment area for any of the federal criteria pollutants.

3.2.5 Water Resources

Freshwater and marine resources in this area of Water Resource Inventory Area (WRIA) 15 include Sinclair Inlet, Dyes Inlet, the Port Washington Narrows, and the associated watersheds that flow into these marine systems. Both Fresh and Marine water are classified under the following system and earn these designations by meeting or exceeding established criteria

related to watershed use and water quality. These designations are determined by the State of Washington and described in WAC 173-201A.

FRESH WATER

Sinclair Inlet Watershed

The Sinclair Inlet Watershed is located south of Bremerton in central Kitsap County. Surface waters flowing into the Sinclair Inlet are primary contacts as designated by the State of Washington (WAC 173-201A). The following freshwater bodies are within the Sinclair Inlet Watershed:

- Anderson Creek
- Annapolis Creek
- Beaver Creek
- Blackjack Creek
- Gorst Creek
- Karcher Creek
- Ross Creek
- Ruby Creek
- Sacco Creek
- Wright Creek

Dyes Inlet Watershed

The Dyes Inlet Watershed is located north and west of Bremerton in central Kitsap County. Surface waters of this watershed are primary contact as designated by the State of Washington (WAC 173-201). The following freshwater bodies are within the Dyes Inlet Watershed:

- Barker Creek
- Chico Creek
- Clear Creek
- Dickerson Creek
- Kitsap Creek
- Mosher Creek
- Ostrich Bay Creek
- Pahrmann Creek
- Ridgetop Creek
- Strawberry Creek
- Steele Creek

MARINE WATER

Sinclair Inlet

The Sinclair Inlet is a shallow estuary with a smooth, muddy bottom. This water body is characterized by weak tidal currents that result in a low flushing rate for the inlet; thus, contaminants entering the inlet are not always flushed out and can remain and degrade water and habitat quality. The Sinclair Inlet supports shellfish harvest, has been classified as being of excellent quality for Aquatic Life Uses, and is a primary contact for recreational uses according to the State of Washington (WAC 173-201A).

Dyes Inlet and Port Washington Narrows

The Port Washington Narrows flows between Dyes and Sinclair Inlets. Strong currents, associated with the tidal cycles, characterize the movement of water through Port Washington

Narrows. Dyes Inlet is a shallow estuary with a muddy bottom. This water body is characterized by weak tidal currents that result in a low flushing rate for the inlet, thus contaminants entering the inlet are not always flushed out and can remain and degrade the water and habitat quality. Dyes Inlet and Port Washington Narrows are classified as being of excellent quality for aquatic life uses, support shellfish harvest, and are significant contacts for recreational uses according to the State of Washington (WAC 173-201A).

Other Water Resources

The waters within Bremerton's service area have differing water quality due to natural conditions and historical practices. Based on a review of past water quality studies and planning documents, a general assessment of the water quality trends of major water resources is provided in Table 3-1**Error! Reference source not found.**.

Table 3-1: Major Water Resources

Water Body	Current Water Quality
Kitsap Lake [(1)(2)]	Good
Sinclair Inlet [(1)(3)]	Excellent
Dyes Inlet [(1)(3)]	Excellent
Anderson Creek	Excellent
Union River	Excellent

Notes:
Source: Kitsap Co. Health Dist. (SSWM) 2023 Water Quality Monitoring Report.
(1) Water body is 303(d) listed for fecal coliform bacteria.
(2) Water body is 303(d) listed for phosphorus.
(3) Water body is 303(d) listed for heavy metal, organic, and/or inorganic parameters.

Kitsap Lake often faces challenges related to high phosphorus levels, which can lead to harmful algal blooms. Currently, elevated levels of fecal coliform bacteria have been detected, especially after rain events, indicating potential contamination from stormwater runoff or failing septic systems.

Wetlands, Floodplains, and Coastal Zones

Known wetlands exist within the study area. Adjacent coastal zones include Port Washington Narrows, Sinclair Inlet (adjacent to Callow Avenue Basin), and Port Orchard Bay (adjacent to Trenton Avenue Basin). The Flood Insurance Rate Map (FIRM) published by the U.S. Department of Housing and Urban Development breaks the City down into three flood zones. FIRM zones and areas include:

The Department of Housing and Urban Development classifies the City into three flood zones based on the Flood Insurance Rate Map (FIRM). These zones are as follows:

- Zone A1: Identified as areas subject to a 100-year flood event, with base flood elevations and flood hazard factors determined. This includes the entire city coastline and the shoreline of Kitsap Lake (elevation 159 feet).
- Zone B: Areas situated between the limits of the 100-year and 500-year flood zones. It also includes areas prone to 100-year flooding with average depths of less than one foot or where the contributing drainage area is less than one square mile, or those protected by levees. A small 5 to 6 block area south of Kitsap Way (a low-lying region) falls under Zone B.
- Zone C: This zone is defined as areas with minimal flooding risk and covers the remainder of Bremerton.

The City is aware that sea level rise could affect existing sewer facilities, especially in low-lying areas, including some pump stations, sewers in or adjacent to marine waterbodies, CSO outfalls, the WWTP, and ESTP. This WWCP update does not address the impacts of sea level rise on the City's infrastructure.

3.2.6 Wildlife and Endangered Species

The following threatened, endangered, proposed, or candidate species listed in Table 3-2 have been identified by the U.S. Fish and Wildlife Service (USFWS), and the Washington Department of Fish and Wildlife (WDFW) as species that may occur in the planning area.

Table 3-2: Species of Concern Identified by USFWS and NMFS in the Project Area

Common Name	Scientific Name	Federal Status	State Status
USFWS			
Bull trout (coastal-Puget sound DPS)	*Salvelinus confluentus*	Species Threatened	Candidate
Marbled murrelet	*Brachyramphus Marmoratus marmoratus*	Species Threatened	Threatened
Chinook salmon	*Oncorhynchus tshawytscha*	Species Threatened	Threatened
Steelhead	*Oncorhynchus mykiss*	Species Threatened	None

Source: WDFW 2019

3.3 Sewer Service Area

Bremerton's sewer service area is depicted in Figure 3-2. Bremerton's service area includes Urban Growth Areas (UGAs). Along with providing retail sewer service in these regions, the City also accepts sewer flows from the U.S. Navy's Puget Sound Naval Shipyard (PSNS) and Kitsap Sewer District No. 1 (KCSD No. 1). The figure also highlights new service areas, which primarily

consist of unsewered regions where the City plans to extend sewer services in the future. Detailed planning documents have been created to outline these areas.

Within the existing sewer service area, there are two locations not included within a UGA boundary. One is situated north of Kitsap Lake, and the other is located southwest of the lake. Both areas currently have sewer facilities serving existing customers. The City has halted new service sales in these regions while awaiting modifications to the UGA boundaries, which will be assessed during Kitsap County's 2024 Comprehensive Plan Update process.

3.3.1 Service Agreements

The City has Negotiated Sewer Services Contracts with the U.S. Navy and Kitsap County Sewer District No. 1 (KCSD No. 1). The U.S. Navy agreement was updated in 2008 and the KCSD No. 1 agreement from 1992 remains in effect. Copies of the agreements are included in Appendix E. Additionally, the City has entered into Interlocal Agreements (ILAs) with both the Port of Bremerton and Mason County to coordinate sewer service for the Puget Sound Industrial Center (PSIC). These ILAs are expected to result in formal service agreements with these two agencies.

U.S. Navy

The U.S. Navy Contract with the City includes metered discharges from PSNS, Jackson Park Navy Family Housing (currently known as The Landings Family Housing), Naval Hospital Bremerton, and Camp McKean located on the west side of Kitsap Lake. Charges for service are based on water meter readings. The U.S. Navy Contract states that Bremerton will convey, treat, and dispose of sewage discharges from these facilities. However, the U.S. Navy owns and maintains the pump stations and sewage collection system at the facilities and discharges to Bremerton's system at designated discharge locations. The discharge locations and discharge limitations are detailed in the Negotiated Sewer Service Contract. At PSNS, the Navy's contracted peak discharge is 2,500 gallons per minute (gpm) at Cambrian Avenue, which discharges to the City Sewer Pump Station WB-3, and 500 gpm at First Street, which pumps to the City Sewer Pump Station CE-4.

Kitsap County Sewer District No. 1

KCSD No.1 is located directly northeast and southwest of the WWTP. KCSD No. 1 discharges to Bremerton through two pump stations (WB-1 and WB-2) and by gravity discharge. The Contract was established in 1992, and allows KCSD No. 1 to discharge up to 400,000 gallons per day (gpd) from the three discharge locations. The City is responsible for conveyance, treatment, and disposal of these contracted discharges from the connection point to the City's system to the City's WWTP. The pump stations and gravity collection system within the KCSD boundary are owned, operated, and maintained by Kitsap County.

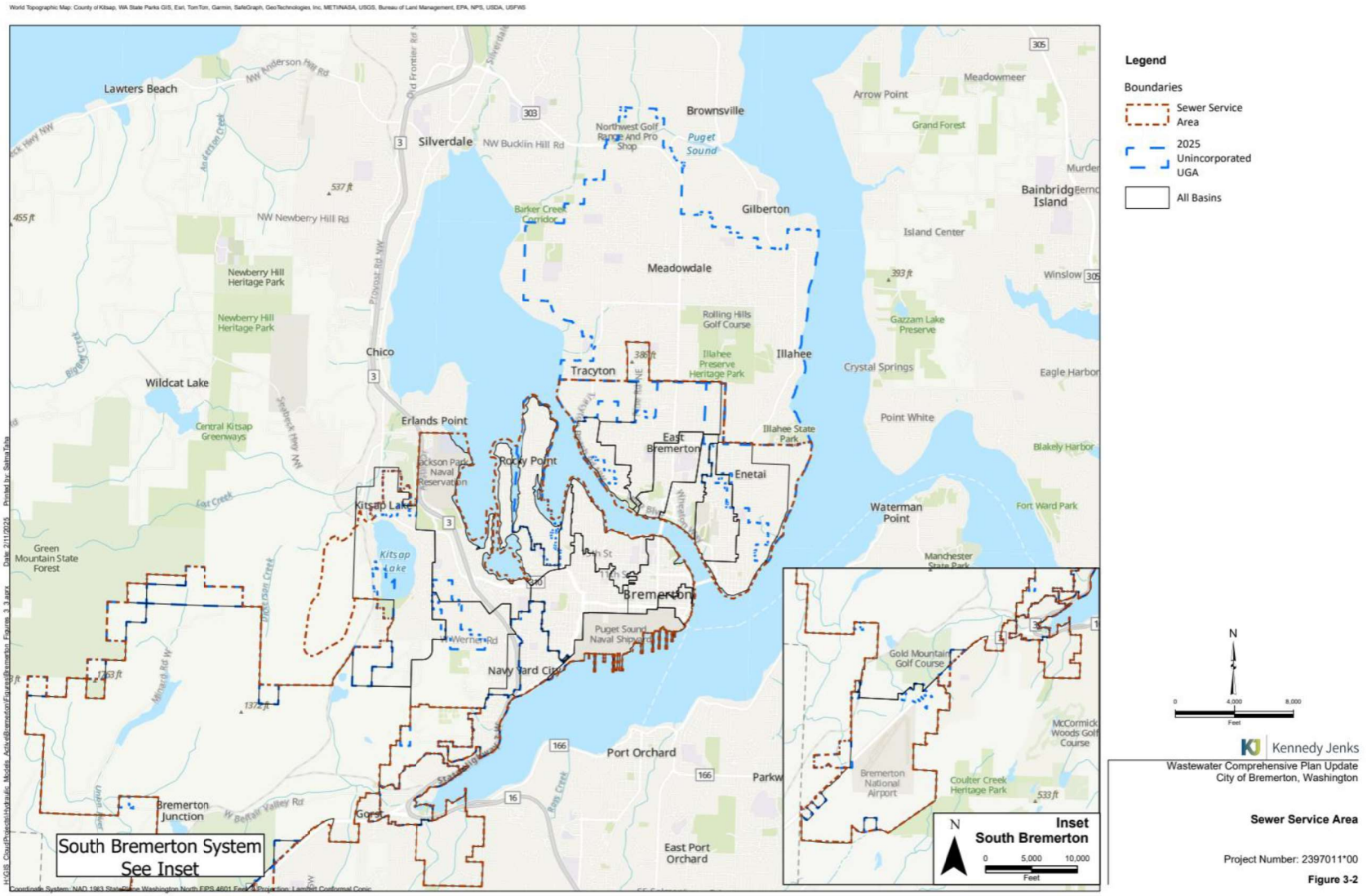

Figure 3-2: Sewer Service Area

3.4 Infrastructure Description

3.4.1 Overview

The City's sewer system is composed of several components, which are listed below and shown in Figure 3-3 and Figure 3-4.

- **Sewer Basins:** Twenty-two (22) sewer basins; six (6) in East Bremerton with a sewered area of 1,660 acres, and sixteen (16) in West Bremerton with a sewered area of 5,360 acres.

- **Pipelines:** Approximately 176 miles of gravity and pressure pipelines, ranging in size from six to 42 inches in diameter. Materials include polyvinyl chloride (PVC), high density polyethylene (HDPE), asbestos-cement, clay, cast iron, concrete cylinder pipe, and ductile iron (DI) pipe.

- **Pump Stations:** Forty (40) sewer pump stations including the two Kitsap County pump stations, WB-1 and WB-2.

- **Odor Control Stations:** Two (2) odor control stations are located in the collection system at surge chambers where pressure sewers transition to gravity sewers. Additionally, five (5) pump stations have dedicated odor control systems at the pump station wet wells.

- **CSO Outfalls:** Fourteen (14) CSO outfalls (OF) for discharging untreated combined sewer flows into Puget Sound during extreme wet weather events. OF-12 was eliminated in 2020 with the upgrade to CW-4. The City intends to eliminate OF-4 in 2026 upon decommissioning of the beach sewer between E. 16th Street and Pump Station EB-2.

- **Westside Treatment Plant:** One conventional wastewater treatment plant for treating dry weather flows and the majority of wet weather flows. This plant treats all flows generated in the City and service area.

- **Eastside Treatment Plant:** One high-rate clarification and UV disinfection treatment plant for treating excess combined sewer flows generated in East Bremerton during some heavy wet weather conditions.

3.4.2 Sewer Basins and Flow Routing

West Bremerton

There are sixteen (16) sewer basins in West Bremerton, listed in Table 3-3 below. Two of those basins are the contract customers – KCSD No. 1 and PSNS. Four basins are combined that are partially separated with storm water collection and conveyance installed within the right-of-way. The other ten basins have dedicated separate sanitary sewers, and stormwater is conveyed and

handled separately. The total area of the West Bremerton sewer basins is 10,100 acres with an estimated sewered area of 5,359 acres.

Table 3-3: West Bremerton Sewer Basins

Basin Name	Basin Area[1] (Acres)	Percent Developed[2]	Percent of Developed that are Sewered[3]	Sewered Area[4] (Acres)	Combined/ Separated/ Contract
Anderson Cove	385	97%	98%	366	Combined
Callow Basin	644	95%	93%	569	Combined
Kitsap Lake	996	57%	71%	403	Separate
Oyster Bay	958	90%	86%	741	Separate
Pacific Avenue	78	93%	83%	60	Combined
Warren Avenue	309	96%	92%	273	Combined
Anderson Hill Road	470	67%	18%	57	Separate
Gorst	333	48%	57%	91	Separate
Marine Drive	244	92%	22%	49	Separate
Phinney Bay	86	90%	94%	73	Separate
PSNS	385	100%	98%	377	Contract
KCSD No. 1	275	85%	71%	166	Contract
Rocky Point	423	86%	0%	0	Separate
Sherman Heights	209	54%	44%	50	Separate
Sinclair Park	875	54%	75%	354	Separate
PSIC	3,430	52%	97%	1,730	Separate
Total	10,100			5,359	

[1] Excludes parcel area designated as water bodies.
[2] Total area of developed parcels divided by total Basin Area less Right of Way area.
[3] Total area of developed parcels with available sewer service divided by total developed parcel area. The parcel area designated as right of way or undeveloped are excluded.
[4] Sewered Area = Basin Area * % Developed * % Sewered.

The CTP receives flow from Pacific Avenue, Warren Avenue, Anderson Cove, and Callow Avenue Basins, all of the East Bremerton service area, as well as from PSNS and KCSD No. 1, The CTP begins at Pump Station CE-1, which receives flow from the Warren Avenue Basin, part of the Pacific Avenue Basin via CE-6, and all of East Bremerton.

Sewer flow generated in the Pacific Avenue Basin goes to Pump Stations CE-4 and CE-6. Flow from the east half of PSNS is pumped via PSNS Lift Station No. 1 to the City's Pump Station CE-4 located at the Bremerton waterfront. Pump Station CE-4 also receives gravity sewer flow from the Pacific Avenue Basin and pumps into the 8,000-foot long Central Bremerton Force Main (CBFM), which discharges into the CTP at 1st Street and Montgomery Avenue. CE-6 pumps to a force main which runs along Park Avenue, eventually discharging into the Warren Avenue Basin gravity sewer near Dr. MLK Way (formerly 7th Street) and flowing by gravity sewer (referred to as the Park Avenue Sewer) along Park Avenue to CE-1.

In the Anderson Cove Basin, flows are split into five (5) sub-basins, with four (4) sub-basins flowing to Pump Station CW-1, which pumps into the Crosstown Pipeline at 13th Street and Naval Avenue via the 12-inch Naval Avenue Force Main. Flows from the CW-2 sub-basin are

directed to the Callow Avenue Basin, but during low flow, can be diverted to CW-1 via valving at 19th Street and Snyder Avenue. Pump Station CW-4, which is located at the waterfront on the end of Ohio Avenue, can be directed (via the valve cluster at 17th Street and Ohio Avenue) to pump into the CTP at 13th Street and Ohio Avenue, or into the approximately 2,000 feet of beach sewer which runs from the end of High Avenue to CW-1. During wet weather months, CW-4 discharge is directed into the CTP, reducing the flow impact (approx. 600 gpm) to the beach sewer and the potential for CSO events. In dry weather months, flow is directed into the beach sewer to increase flow and velocity for scouring purposes.

In the Callow Avenue Basin, combined sewer flows, along with discharges from the west half of PSNS via PSNS Lift Station No. 9, are directed to City Pump Station WB-3, which then discharges into the CTP. The basin also receives flows from the Phinney Bay Basin at 15th and Cambrian, and from CW-2. To reduce CSO events, Bremerton constructed wet-weather Pump Station WB-6 near WB-3. During high flow events, flow will back up to WB-6, which pumps to the CTP. When WB-6 cannot keep up with excess combined sewer flow in the Warren Avenue Basin, a CSO event will occur at OF-17 (the most recent event was in 2021).

Sanitary sewer flows from the Oyster Bay and Kitsap Lake Basins are routed through a series of pump stations that ultimately discharge into the Sinclair Park Basin and then flow by gravity to the WWTP. Flows from the Gorst, Anderson Hill Road, and most of Sherman Heights Basins pump to the WWTP through a series of force mains via Pump Stations SB-1, SB-2, SB-3, and SB-4.

East Bremerton

There are six (6) sewer basins in East Bremerton, listed in Table 3-4 below. These are all combined sewer basins that are partially separated with stormwater collection and conveyance installed within the right-of-way. The total basin area is 2,645 acres with an estimated sewered area of 1,660 acres.

Table 3-4: East Bremerton Sewer Basins

Basin Name	Basin Area[1] (Acres)	Percent Developed[2]	Percent of Developed that are Sewered[3]	Sewered Area[4] (Acres)	Combined/Separated
Cherry Avenue	214	95%	82%	168	Combined
East Park	346	81%	88%	247	Combined
Pine Road	871	86%	82%	614	Combined
Stephenson Canyon	299	98%	96%	281	Combined
Tracyton Beach	187	76%	80%	114	Combined
Trenton Avenue	728	82%	39%	233	Combined
Total	2,645			1,665	

[1] Excludes parcel area designated as water bodies.
[2] Total area of developed parcels divided by total Basin Area less Right of Way area.
[3] Total area of developed parcels with available sewer service divided by total developed parcel area. The parcel area designated as right of way or undeveloped are excluded.
[4] Sewered Area = Basin Area * % Developed * % Sewered.

Flows from Tracyton Beach Basin go to Pump station EB-6, in the Pine Rd Basin, that also receives combined sewage from the Pine Rd Basin storm drainage. EB-6 pumps into an 8-inch force main that discharges to the gravity sewer on Lebo Blvd at the edge of Stephenson Canyon Basin. From there, sewer will flow via gravity into the 24-inch EBBM. CSO events will occur at OF-6 if the basin flow exceeds the EB-6 pumping and basin storage capacity. Similarly, in the Trenton Avenue Basin, combined flows enter the gravity beach sewers and eventually enter Pump Station EB-2, which pumps into the EBBM at the base of the Manette Bridge. EB-2 has small pumps (approximately 400 gpm) that operate during dry weather and most conditions, and high flow pumps (max. design flow approximately 4,000 gpm) which will operate during heavy weather conditions when the hydraulic grade line (HGL) in the EBBM increases and diverts the flow to the high flow pumps. CSO events will occur at OF-7 if the flow in the Trenton Avenue Basin exceeds the pumping and storage capacity of that basin. Flows from the Stephenson Canyon Basin are directed to the EBBM via piping at Lent Landing Park, where OF-2 is located. Combined sewage from the Cherry Avenue Basin flows into the EBBM via the OF-3 structure and rock trap manhole. The higher elevation of this site relative to the other CSO sites that discharge to the beach main reduces the potential for a CSO and drives flow to CE-1 during dry weather flow or to the ESTP during large rain events.

During periods of high flow, the EBBM can surcharge and become pressurized. As the HGL rises, flow will back up and divert to the ESTP. The sewer along Lebo Blvd is designed to allow flow to drain back to the ESTP before an overflow can occur at OF-2. The sewer piping along Lebo Boulevard and the storage basin at the ESTP provide approximately 200,000 gallons of storage capacity (100,000 gallons at the ESTP and 100,000 +/- in the conveyance system). When the storage capacity is exceeded, flow will enter the ESTP for treatment. The effluent discharges to the Port Washington Narrows. When the capacity of the ESTP is exceeded, flow will be relieved at OF-1, which is built into the ESTP storage basin.

Figure 3-3: Existing Sewer System and Service Area

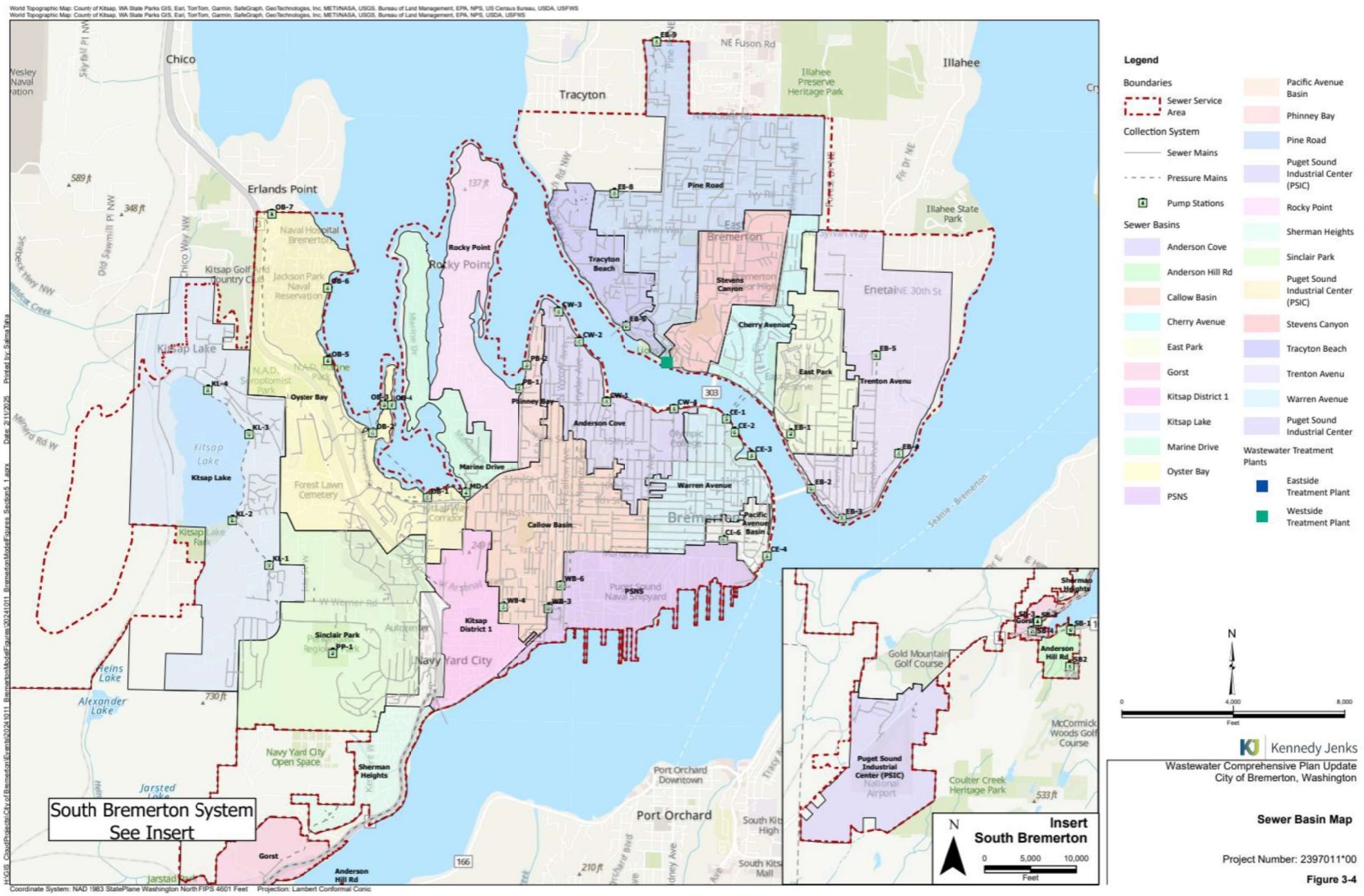

Figure 3-4: Sewer Basins Map

3.4.3 Pump Stations

Bremerton operates 40 pump stations, with pumps ranging from five (5) to 400 horsepower and capacities varying from tens to thousands of gpm. Most pump stations are equipped with variable frequency drives (VFDs) and emergency power backup to ensure continued operation during power outages. Additionally, some of the stations are equipped with odor control equipment and surge tanks.

Numerous individual grinder pumps are installed in areas where gravity sewer connections are not feasible. The City owns and maintains approximately 280 grinder pump stations and the number of these stations increases every year. These stations are installed by private developers when a gravity sewer connection is not feasible. They are also installed by contractors on City capital projects when a beach sewer is being decommissioned and the sewer connection must be redirected to an upland sewer system. They are typically installed at single family residences; however, they have also been used at condominiums, apartments, small businesses, and in the City right-of-way. Typical installation is a single (simplex) 1 hp grinder pump installed in a tank with sufficient storage for 1 to 2 days during a power outage. Larger installations require multiple pumps (duplex and triplex) with larger storage tanks. Service lines on private property are owned and maintained by the owner, and the service line in the right-of-way is owned by the City. The Owners are required to sign a Grinder Pump Service Agreement with the City which clearly defines the ownership and maintenance requirements. The pumps themselves are maintained by the City through a third-party maintenance contract (currently Correct Equipment). The property owners pay a fee on top of their regular sewer bill to cover the cost for maintaining the grinder pumps. The grinder pump stations that are part of this agreement must be manufactured by Environment One (E-One) Corporation.

There are a number of legacy grinder pump stations that were installed prior to the current City policy. Those stations are owned and maintained by the individual property owners. Current policy requires these homeowners to enter into service contracts with third-party entities responsible for maintenance. Table 3-5 provides a summary of the pump stations, and a detailed tabulation of this information is provided in Appendix C.

Table 3-5: Pump Stations

Pump Station	Description	Year Constructed	Pump	VFDs? (Y/N)	Maximum Capacity (gpm)	Backup Power	Basin / Upstream Station	CSO Outfalls	Discharge Location
CE-1	Dry Well, 32ft diameter segmented caisson	1985	Sulzer, 2 Dry-pit Submersible, 128 hp	Y	10,000	Yes	Warren Ave Basin, East Bremerton	OF-13	Start of CTP
			Flygt, 2 Dry-pit Submersible, 385 hp	Y					
CE-2	Dry Well, S&LL Package Pump Station	1973	S&LL, 2 Dry-Pit, 3 hp	N	-	Portable	Warren Ave Basin	-	Park Ave Sewer to CE-1
CE-4	Dry Well	1989	Flygt, 2 Dry-pit Submersible, 160 hp	Y	1,940	Yes	Pacific Avenue Basin, PSNS	-	Central Bremerton FM to CTP
CE-6	Dry Well, Metal, Significant upgrades in 2006	1989	Flygt, 3 Dry-pit Submersible, 12 hp	Y	1,600	Yes	Pacific Avenue Basin	OF-16	Gravity Sewer @ 7th & Park
CW-1	Dry Well, Significant upgrades in 2004/2007	1984	ABS, 3 Dry-pit Submersible, 201 hp	Y	3,500	Yes	Anderson Cove Basin	OF-8, OF-9, OF-10A, OF-11	Naval Ave Force Main to CTP
CW-2	Wet Well	1999	Flygt, 3 Submersible, 75 hp	Y	1,260	Yes	Anderson Cove Basin	OF-8	Callow Ave Sewers, with intertie to CW-1

Pump Station	Description	Year Constructed	Pump	VFDs? (Y/N)	Maximum Capacity (gpm)	Backup Power	Basin / Upstream Station	CSO Outfalls	Discharge Location
CW-3	Wet Well	~1970	Zoeller, 2 Submersible, 2 hp	N	50	Portable	Anderson Cove Basin	-	Gravity sewer on 26th, flows to CW-2
CW-4	Wet Well	2020	Flygt, 2 Submersible	Y	450	Portable	Anderson Cove Basin	-	End of High Ave into beach sewer, intertie to CTP at 13th/Ohio
KL-1	Wet Well, Converted Wet Well, Significant upgrades in 2013 (Conversion)	~1970	Flygt, 2 Submersible, 30 hp	N	950	Yes	Kitsap Lake Basin, KL-2	-	Gravity Sewer Near Pendergast Field to WWTP
KL-2	Dry Well	~1970	Flygt, 2 Dry-pit Submersible, 85 hp	Y	1,150	Yes	Kitsap Lake Basin, KL-3	-	KL-1
KL-3	Dry Well	~1970	Fairbanks Morse, 2 Dry-pit Submersible, 5 hp	N	450	Yes	Kitsap Lake Basin, KL-4	-	KL-2
KL-4	Dry Well	~1970	Fairbanks Morse, 2 Dry-pit Submersible, 5 hp	N	475	Yes	Kitsap Lake Basin	-	KL-3
MD-1	Wet Well	1994	Essco, 2 Submersible, 40 hp	N	950	Portable	Marine Drive Basin	-	Kitsap Way gravity sewer, flows to OB-1

Pump Station	Description	Year Constructed	Pump	VFDs? (Y/N)	Maximum Capacity (gpm)	Backup Power	Basin / Upstream Station	CSO Outfalls	Discharge Location
OB-1	Dry Well	1966	Flygt, 3 Dry-pit Submersible, 65 hp	Y	-	Yes	OB Basin, MD-1, OB-2	-	Gravity Sewer at Bremerton Blvd & Arsenal Way
OB-2	Dry Well	1966	Flygt, 2 Dry-pit Submersible, 15 hp	Y	-	Yes	OB Basin, OB-3, OB-5	-	OB-1
OB-3	Dry Well	1970	Fairbanks, 2 Dry-pit Submersible, 5 hp	N	-	Portable	Madrona Point, OB-4	-	OB-2
OB-4	Dry Well	1971	Fairbanks, 2 Dry-pit Submersible, 5 hP	N	-	Portable	Madrona Point	-	OB-3
OB-5	Dry Well, May be upgraded in near future	1966	Flygt, 1 Dry-pit Submersible, 12 hp	Y	500	Portable	Oyster Bay Basin, OB-6	-	OB-2
		-	Flygt, 1 Dry-pit Submersible, 15 hp	Y	-	-	-	-	-
OB-6	Dry Well	1966	Flygt, 2 Dry-pit Submersible, 15 hP	N	-	Portable	Oyster Bay Basin	-	OB-5
OB-7	Wet Well	~1970	Essco, 2 Submersible, 50 hp	N	-	No	Erland Point Apartment	-	Gravity Sewer on Austin Dr 600' NW of Olding Rd
PB-1	Dry Well, S&LI Package Pump Station	~1970	Flygt, 2 Dry-pit Submersible, 20 hp	N	-	Portable	Phinney Bay Basin	-	Callow Avenue gravity sewer

Pump Station	Description	Year Constructed	Pump	VFDs? (Y/N)	Maximum Capacity (gpm)	Backup Power	Basin / Upstream Station	CSO Outfalls	Discharge Location
PB-2	Dry Well, S&LI Package Pump Station	~1970	Fairbank-Morse, 2 Dry-pit	N	350	Portable	Phinney Bay Basin		PB-1
PP-1 (PG)	Wet Well	~1990	Essco, 2 Submersible, 8 hp	N	140	Portable	Services Pendergast ONLY	-	KL-1 discharge gravity sewer, south of Francis St.
SB-1	Wet Well	-	Flygt, 2 Submersible, 105 hp	Y	-	Yes	-	-	SW Bremerton Force Main
SB-2	Wet Well	-	Flygt, 2 Submersible, 11 hp	Y	-	Yes	-	-	SB-1
SB-3	Wet Well	-	Flygt, 2 Submersible, 23 hp	Y	-	Yes	-	-	SW Bremerton Force Main
SB-4	Wet Well	-	Flygt, 2 Submersible, 24 hp	Y	-	Yes	-	-	SW Bremerton Force Main
WB-1	Wet Well, Maintained by KCSD#1	1989	2 Submersible	-	-	No	Sinclair Park, Beachfront	-	Crosstown Pipeline
WB-2	Dry Well, Maintained by KCSD#1	1989	-	-	-	No	KCSD #1	-	Crosstown Pipeline

Pump Station	Description	Year Constructed	Pump	VFDs? (Y/N)	Maximum Capacity (gpm)	Backup Power	Basin / Upstream Station	CSO Outfalls	Discharge Location
WB-3	Dry Well	2002/2003	Flygt, 2 Dry-pit Submersible, 20 hp	Y	10,000	Yes	Callow Ave, PSNS, Phinney Bay, Anderson Cove	OF-17	Crosstown Pipeline
			Fairbanks, 3 Dry-pit Submersible, 238 hp	Y	-	-	-	-	-
WB-4	Dry Well, S&LI Package Pump Station	1971	Smith & Loveless, 2 Dry-pit, 5 hp	N	-	Portable	Callow Ave Basin	-	Farragut St gravity sewer that goes to WB-3
WB-6	Wet Well, CSO Flow Only	2003	Flo-Serve, 3 Submersible, 200 hp	Y		Yes	WB-3 Overflow	OF-17	Crosstown Pipeline
EB-2	High Flow (Wet Well), Active for high flow, Significant upgrades in 2003	1973	Flowserve, 3 Submersible, 75 hp	Y	4,100	Yes	Trenton Ave Basin	OF-7	Eastside Bremerton
	Normal Flow (Wet Well), Active for low flow	-	Flygt, 2 Submersible, 5 hp	N	-	-	-	-	Gravity sewer on E. 10th, flows to EB-2

Pump Station	Description	Year Constructed	Pump	VFDs? (Y/N)	Maximum Capacity (gpm)	Backup Power	Basin / Upstream Station	CSO Outfalls	Discharge Location
EB-3	Dry Well, Significant upgrades in 1984, 2005.	1972	Flygt, 2 Dry-pit Submersible, 30 hp	Y	1,400	Yes	Trenton Ave Basin	OF-7	Gravity sewer on Jacobsen Blvd by Trenton Ave
EB-4	Wet Well, Converted Wet Well	~1940	Flygt, 2 Submersible, 7.5 hp	N	-	Portable	Trenton Ave Basin	-	Trenton Ave at Holman St gravity sewer
EB-5	Wet Well, Converted to Wet Well, Significant upgrades in 1995	~1970	Zoeller, 2 Submersible, 2 hp	N	-	Portable	Trenton Ave Basin	-	Trenton Ave at Holman St gravity sewer
EB-6	Wet Well, Significant upgrades in 2004	1947	Flygt, 3 Submersible, 45 hp	Y	1,200	Yes	Tracyton Beach Basin	OF-6	Gravity sewer at Lebo Blvd and Hefner St
EB-7	Pending (2025)								
EB-8	Dry Well, S&LI Package Pump Station	1971	Smith & Loveless, 2 Dry-pit, 10 hp	N	-	Portable	Pine Road Basin	-	Gravity sewer at Sugar Pine Dr and Pinecone Dr

Pump Station	Description	Year Constructed	Pump	VFDs? (Y/N)	Maximum Capacity (gpm)	Backup Power	Basin / Upstream Station	CSO Outfalls	Discharge Location
EB-9	Wet Well	~1970	Flygt, 2 Submersible, 10 hp	N	-	Portable	Pine Road Basin	-	Gravity sewer on NE Pinecrest Dr

3.4.4 Sewer Pipelines

The City's sewer collection system main diameters range from 6 to 42 inches for gravity mains and 4 to 36 inches for force mains. These sewers are constructed from various materials, including clay, concrete, PVC, asbestos cement, cast iron, DI, and HDPE, with some sections dating back to 1910-1920. Major conveyance, overflow, treatment facilities, and wholesale connection points are illustrated in Figure 3-3. Three of the major pipelines are discussed in this section. The Central Bremerton Force Main, another major pipeline from CE-4 to the CTP, is also mentioned in this section.

Crosstown Pipeline

The Crosstown Pipeline conveys flows from all of East Bremerton and much of West Bremerton to the WWTP. The CTP originates at Pump Station CE-1. CE-1 receives flows from all of East Bremerton through 16-inch and 24-inch siphons under Port Washington Narrows, the Warren Avenue Basin gravity sewers, and the Pacific Avenue Basin via CE-6. Pump Station CW-1 in the Anderson Cove Basin discharges to the CTP through the Naval Avenue Force Main at 13th Street and Naval Avenue. The Central Bremerton Force Main, an 8,000-foot long pressure sewer which originates at Pump Station CE-4 at the Bremerton waterfront, discharges to the CTP at First Street and Montgomery Avenue. Pump Stations WB-3, WB-6, WB-2, and pump stations from Kitsap County Sewer District No. 1, discharge directly into the CTP as it approaches the WWTP. All flow from PSNS eventually discharges to the CTP, since PSNS discharges to either CE-4 or WB-3. Pump Stations SB-1, SB-3, and SB-4 discharge into the Southwest Bremerton Sewer, which subsequently feeds into the CTP as it enters the south end of the WWTP property.

The CTP's alignment is approximately 19,300 feet in length. The pipe materials include prestressed concrete cylinder pipe (PCCP), HDPE, polyethylene-lined DI, CIPP-lined DI, and cement-lined DI. The initial section from Pump Station CE-1 (located at the north end of Park Avenue) is a 24-inch DI force main which discharges into the HDPE surge chamber at 13th Street and Naval Avenue. Both the Naval Avenue Force Main (from CW-1) and the CTP converge at this surge chamber. From this location to the WWTP, the CTP operates as a gravity-pressure main with an inverted siphon configuration. The section of the CTP from this location to the intersection of 9th Street and Montgomery Avenue was replaced and/or rehabilitated in 2013 using HDPE pipe and CIPP-lining of existing 30-inch DI pipe. At 9th and Montgomery, the pipe transitions to 30" PCCP, then transition to 36" PCCP near WB-3.

East Bremerton Beach Main

The East Bremerton Beach Main conveys wastewater from the East Bremerton sewer basins to the inverted siphons and/or the ESTP entry points to the beach main and the associated CSO outfalls include adjacent to the ESTP (OF-1), Lent Landing Park (OF-2), Riptide Condominiums, Lower Wheaton Way (OF-3), East 16th Street (OF-4), and Pump Station EB-2 next to the Manette Bridge (OF-7 at Trenton and Shore Drive). The EBBM main is approximately 7,500 feet in length with diameters varying in size from 18-inch to 24-inch. Materials include HDPE and DI. A 3,000-foot long section of 20-inch asbestos cement pipe between the ESTP and the siphons was replaced with 24-inch HDPE in 2013. The 20-inch AC pipe remains buried in the beach and was abandoned in-place.

Port Washington Narrows Inverted Siphons

Two inverted siphon pipelines convey combined sanitary sewer flows from East Bremerton across the Port Washington Narrows to Pump Station CE-1 in West Bremerton. These pipelines are 16-inch cast iron (constructed in 1946) and a 24-inch concrete-lined DI (constructed in 1983.) The connections of the EBBM to the siphons were replaced in 2005 and include isolation valves and pigging ports.

In 2011, Bremerton installed stainless steel knife gate valves on the discharge side of the siphons at Pump Station CE-1. These valves enhance regulatory compliance by allowing the City to prevent East Bremerton flows from causing overflows at OF-13 (CE-1). During major storm events, excess flows from East Bremerton can be treated and discharged at the ESTP, freeing capacity in the Crosstown Pipeline for West Bremerton flows.

3.4.5 Combined Sewer Overflow Outfalls

The City's wastewater collection system contains 14 CSO outfall sites, which typically consist of an overflow weir, equipment to measure flow and duration of flow over the weir, and the outfall piping. The outfalls considered for this comprehensive plan project are listed in the Table 3-6 below. OF-12 is not included in this list since this CSO outfall was decommissioned as part of the CW-4 Upgrade project in 2020, which will be reflected in the City's next NDPES wastewater permit issued by Ecology. The City also anticipates abandoning OF-4 upon completion of decommissioning the 8-inch beach sewer between E. 16th Street and EB-2 in 2026.

Table 3-6: CSO Outfalls

Outfall Number	Basin	Receiving Water Body
OF-1	Pine Road	Port Washington Narrows
OF-2	Stephenson Canyon	Port Washington Narrows
OF-3	Cherry Avenue	Port Washington Narrows
OF-4	East Park	Port Washington Narrows
OF-6	Tracyton	Port Washington Narrows
OF-7A	Trenton Avenue	Port Washington Narrows/Port Orchard Bay
OF-7B	Trenton Avenue	Port Washington Narrows/Port Orchard Bay
OF-8	Anderson Cove	Port Washington Narrows
OF-9	Anderson Cove	Port Washington Narrows
OF-10	Anderson Cove	Port Washington Narrows
OF-11	Warren Avenue	Port Washington Narrows
OF-13	Warren Avenue	Port Washington Narrows
OF-16	Pacific Avenue	Sinclair Inlet
OF-17	Callow Basin	Sinclair Inlet

The following four bullets are in reference to the City's 2023 CSO Annual Report (submitted to Ecology on May 30, 2024),

- **Compliance:** The City is still in compliance with CSO reduction requirements at 13 of the 14 sites. To be in compliance, the City must achieve a rolling 20-year average of less than one

CSO event per year at each outfall site. At OF-11, the rolling average was 1.05. The City is programming a capital project at this outfall to upsize the stormwater outfall that is causing the CSO events to occur.

- **Reduction of Overflow Volume and Frequency:** The City has successfully reduced the volume of overflow by 99% and the frequency of CSO events by 99% as well.
- **Precipitation Events:** The City has continued to experience significant rainfall events which generally correlate with CSO events.
- **Public Education:** The City has maintained its public education and assistance program, which involves citizens in CSO reduction and educates them on water pollution prevention.

3.4.6 Collection System Odor Control Stations

Bremerton operates seven odor control stations to manage odors in the collection system, as detailed in Table 3-7. Odor Control Stations OCS -1, -2, and -3 are packed tower scrubbers utilizing sodium hypochlorite and caustic soda; tanks are refilled about three times annually. OCS-4 through OCS-7 consist of granulated activated carbon (GAC). OCS-1 and OCS-2 are installed in the collection system near the surge chambers where pressure sewer transitions to gravity sewer, whereas OCS-3 through OCS-7 are installed at pump station wet wells.

Table 3-7: Collection System Odor Control Stations

Station Name	Location	Type of Facility	Chemical Storage Tank Size and Type	Pump Station or Area Served	Year Built
OCS-1	2100 12th Street	Packed tower scrubber with sodium hypochlorite and caustic injection	500-gallon storage tanks for sodium hypochlorite and caustic soda	Convergence of Crosstown Pipeline from CE-1 and Naval Avenue Force Main from CW-1. Transitions from pressure to gravity sewer at this location	1996
OCS-2	200 High Ave.	Carbon tower scrubber	GAC Tower	Transition from pressure to gravity sewer for Central Bremerton Force Main from CE-4	1996

Station Name	Location	Type of Facility	Chemical Storage Tank Size and Type	Pump Station or Area Served	Year Built
OCS-3	1740 Park Ave.	Packed tower scrubber with sodium hypochlorite and caustic injection	500-gallon storage tanks for sodium hypochlorite and caustic soda	CE-1	1996
OCS-4	2304 19th Street	Carbon tower scrubber	GAC Tower	CW-1	1996
OCS-5	416 S. Cambrian	Carbon tower scrubber	GAC Tower	WB-3	1996
OCS-6	100 2nd Street	Carbon tower scrubber	GAC Tower	CE-4	1996
OCS-7	622 Burwell Street	Carbon tower scrubber	GAC Tower	CE-6	1996

3.4.7 Wastewater Treatment Facilities

The City owns, operates, and maintains two wastewater treatment facilities, namely the WWTP and the ESTP. Both sites are located outside the boundaries of established floodplains and shorelines and do not contain any onsite environmentally sensitive areas or wetlands.

Westside Wastewater Treatment Plant

The WWTP provides secondary treatment for the entire service area, with a peak hydraulic capacity of 65 million gallons per day (MGD). It uses a conventional activated sludge secondary treatment process. The plant is located in West Bremerton and discharges treated effluent into Sinclair Inlet. The treatment process flow diagram is shown in Figure 3-5 and the treatment site plan is shown in Figure 3-6.

The WWTP collects wastewater sludges, which are anaerobically digested, treated to Class B standards, dewatered, and reused at Bremerton's silviculture site.

Odor control measures and facilities at the WWTP include:

- Odor containment enclosures and covers for major facilities.
- Foul air conveyed to packed tower scrubbers for treatment.
- Two-stage packed tower treatment for facilities such as screenings, grit removal, primary clarifiers, old headworks, overflow chambers, gravity thickener, digester vents, centrifuge area, and sludge loading facility.
- Enclosures for the grit removal system.

- Single-stage packed towers for Biofilter wet well, aeration basin headworks, return activated sludge (RAS) wet well, and secondary clarifier scum pits.

The WWTP outfall was constructed in 1971 and consists of 36-inch reinforced concrete pipe that was jacked through a casing under the Burlington Northern railroad track and laid along the bottom of Sinclair Inlet. The outfall is approximately 570 feet in length and the pipe was installed in 12-foot sections with bell and spigot joints. The joints are restrained using stainless steel all-thread rod at the springline connected to lugs. The diffuser has 22 ports and lays at approximately -40 feet mean lower low water (MLLW). The outfall was last inspected in November 2018 by Cosmopolitan Engineering. An outfall evaluation report was prepared and is included in the Appendix F. The report concluded that the outfall and diffuser are in good condition and operating as intended.

Eastside Treatment Plant (ESTP)

The Eastside Treatment Plant was constructed in 2001 to reduce CSO discharges by treating wet weather combined sewer generated in East Bremerton when the EBBM surcharges. The ESTP has a peak hydraulic capacity of 20 MGD and utilizes high-rate clarification followed by ultraviolet (UV) disinfection to meet secondary water quality standards. The ESTP is located in the Pine Road Basin and discharges into the Port Washington Narrows. The plant's process diagram is shown in Figure 3-7. A capital project scheduled for 2026 is intended to replace the UV disinfection components.

The ESTP outfall system was originally constructed in 1947 as part of the Manette Primary Treatment Plant. The outfall was reconstructed in 2018 and consists of sixty (60) feet of original cast iron pipe lined using cure-in-place-pipe (CIPP) technology, 373 feet of mechanically restrained 36-inch reinforced concrete pipe, and a single port 36-inch elastomeric diffuser check valve (Redflex duck bill). The total outfall length is approximately 450 feet. The invert of the diffuser is -25 feet MLLW.

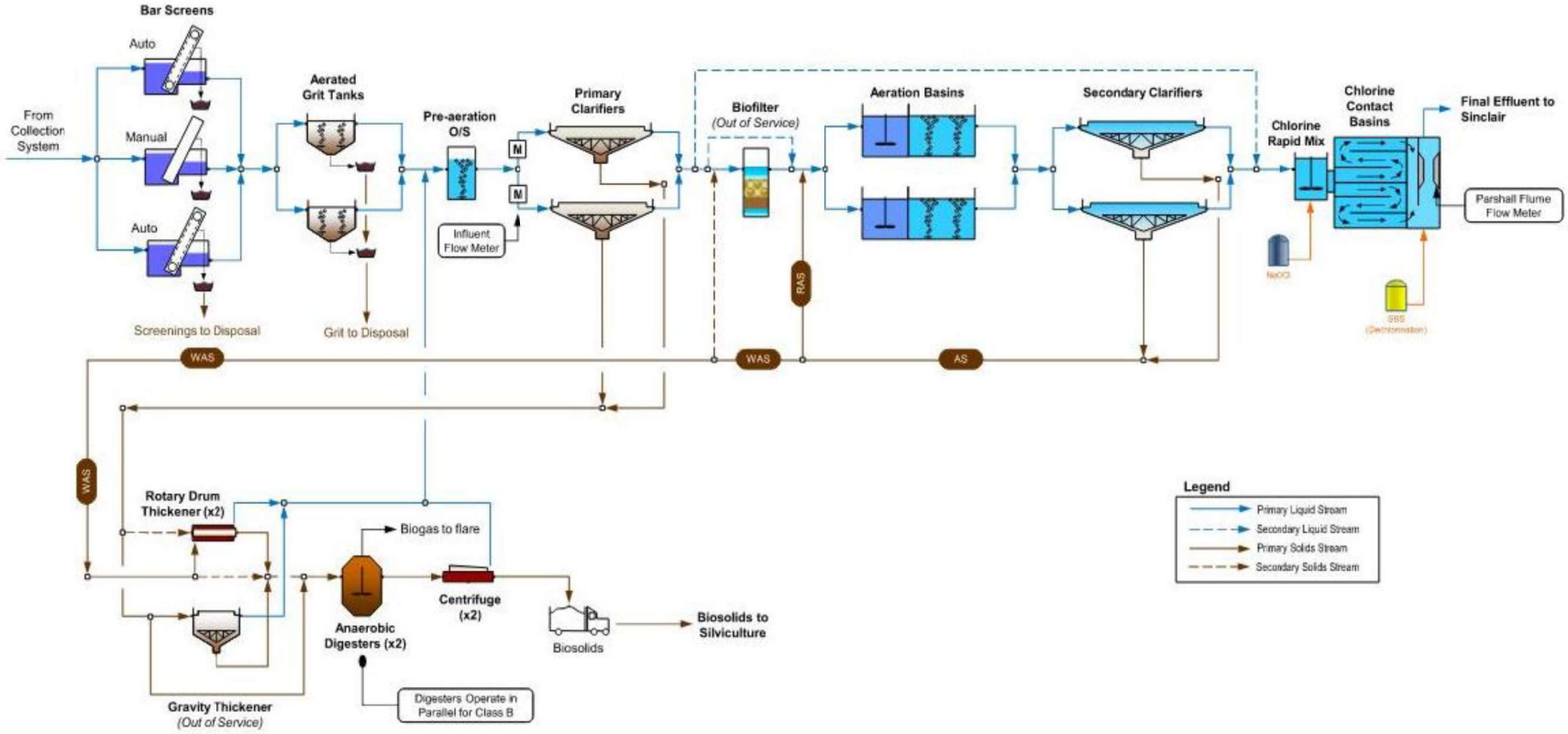

Figure 3-5: Westside Wastewater Treatment Process Schematic

Source: 2023 Nitrogen Optimization Plan and Report, HDR

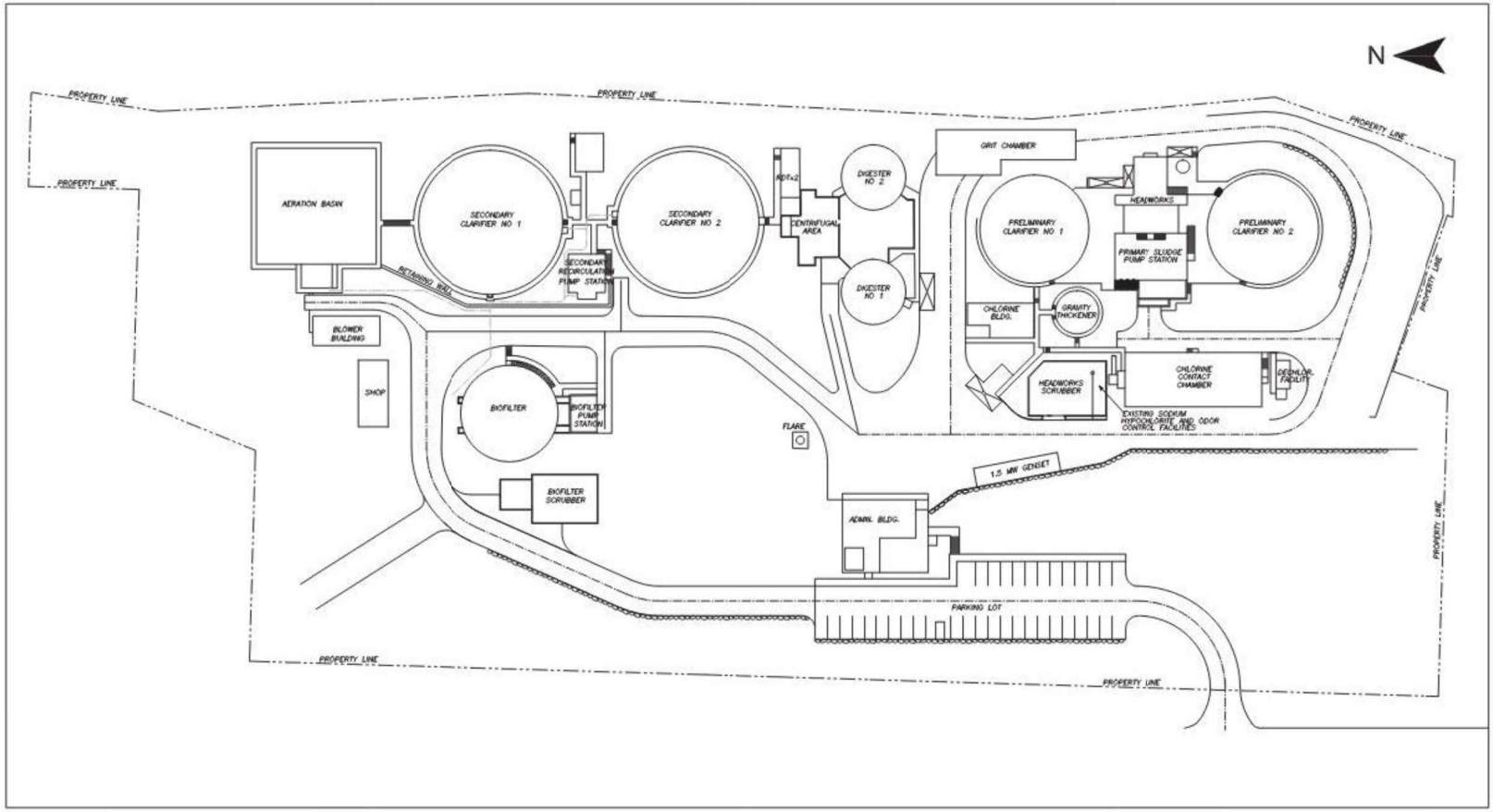

Figure 3-6: Westside Wastewater Plant

Source: 2014 Wastewater Comprehensive Plan Report, HDR

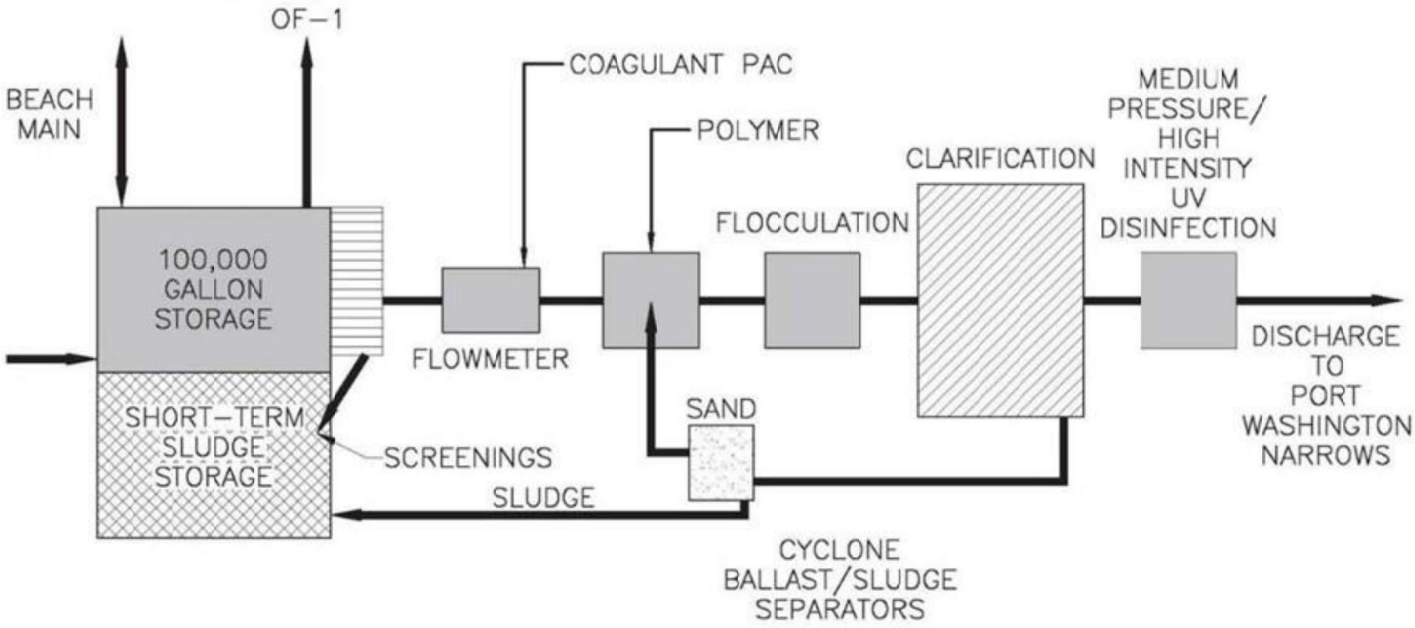

Figure 3-7: Eastside Treatment Process Diagram

Source: 2014 Wastewater Comprehensive Plan Report, HDR